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VOL. V. MARCH, 1907 NO. 75

MYCOLOGICAL BULLETIN

W. A. KELLERMAN, Ph. D. OHIO STATE UNIVERSITY

ENTERED AS SECOND CLASS MATTER MAY 11, 1906, AT THE POSTOFFICE AT COLUMBUS, OHIO.

Edited and Published by
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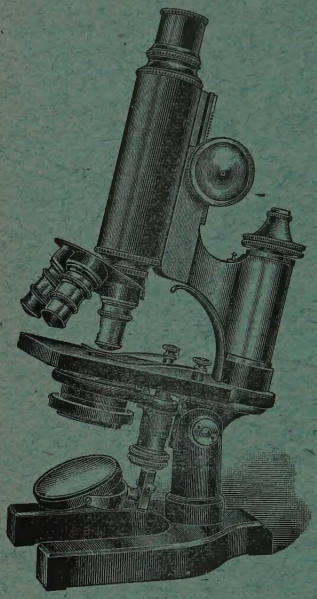

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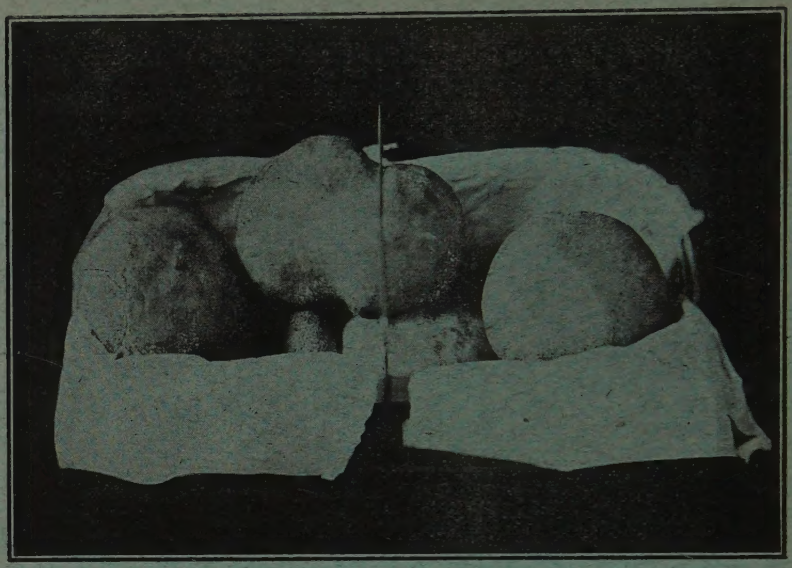

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Mycological Bulletin

No. 75

W. A. Kellerman, Ph. D., Ohio State University
Columbus, March, 1907.

TYLOSTOMA CONCLUDED—CORTINARIUS BEGUN

The valuable monagraph of the stemmed puffballs, *Ty-los-to-ma* by C. G. Lloyd in his Mycological notes, with admirable illustrations, we complete in this number. We desire to give our readers some idea of what Mr. Kauffman is doing to increase our knowledge of the large, conspicuous and interesting genus *Cor-ti-na-ri-us*. We will reproduce a part of his article published in the *Botanical Gazette, Torrey Bulletin* and the *Journal of Mycology* with half a dozen or more plates of his new species.

GROUP 8.

TYLOSTOMA POCULATUM.—Peridium smooth, pale, with a strongly raised shield-shaped fibrillose mouth. Cortex thick, breaking away *perfectly* from the peridium which it leaves *perfectly smooth* excepting at the base where the thick cortex persists as a kind of cup. Stem pale or slightly colored, sulcate, striate, not scaly, usually thickened below (sometimes strongly) with the mycelial, adnate sand. Capillitium subhyaline, or sometimes distinctly colored, sparingly septate, with slightly thickened septa. Spores 5 mic., *smooth.*

This is a most peculiarly marked species. both in its mouth and cortex characters and we know no other species having either of the characters so strongly marked. It occurs chiefly in our western states, but we have it also from Australia. No form is known in Europe. Tylostoma minutum is, in my opinion, based on a small specimen of it. It varies in two features, color and roughness of the spores, and plants so varying have been called species, but to my mind they are so close that they may better be called forms.

Fig. 231.—Ty-los'-to-ma tu-ber-cu-la'-tum. (C. G. Lloyd).

FORMS OF TYLOSTOMA POCULATUM.

TYLOSTOMA TUBERCULATUM.—We find specimens agreeing with Tylostoma poculatum in general characters, and so close to it they can not be distinguished except by the microscope, that differ in having spores not smooth but granular. For us it is a form but for those who give their species no latitude as to *spore variation* it is a strong species. We are not sure it is Miss White's plant, as we would describe the spores as "granular" instead of with "occasional tuber-like warts," but we prefer to use her name rather than to propose a new one.

Fig. 232.—Ty-los'-to-ma sub-fus'-cum. (C. G. Lloyd).

TYLOSTOMA SUBFUSCUM.—The usual color of Tylostoma poculatum is pale tan but sometimes collections are dark chocolate brown. Sometimes both colors occur in same collection and I have noted all shades of connecting colors. The extreme color form, however, is very marked. Spores are granular in all we have examined.

Fig. 233.—Ty-los'to-ma lloyd'-i-i. (C. G. Lloyd).

TYLOSTOMA LLOYDII.—Peridium dark, reddish brown, with a thin, closely adnate cortex which separates perfectly above but persists closely adnate at the base. Mouth at first *raised, shield-shaped,* fibrillose. In old specimens these fibrils are worn away, leaving the mouth a naked round, plane opening. Stem *long,* slender, with a dark, scaly, cortex. Capillitium slightly colored, subhyaline, narrow threads with slightly thickened nodes. Spores *smooth,* 4 mic.

This is apparently a very rare and local form but is strongly different from any other species known to me. Prof. W. H. Aikin collected the plants several years ago in the vicinity of Cincinnati, Ohio, and brought the specimens to me. I sent some to Rev. Bresadola who decided it to be undescribed and published it recently (Ann. Mycologici, 1904, p. 423). I have never received specimens from any other collector.

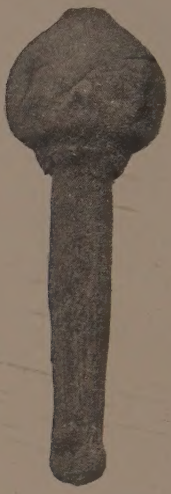

Fig. 234.—Ty-los'-to-ma o-be'-sum. (C. G. Lloyd).

TYLOSTOMA OBESUM.—Peridium uncolored with a raised fibrillose mouth. Cortex separating freely, leaving the peridium smooth. Peridium with a marked collar at base. Stipe, thick, obese. Capillitium strongly colored. Spores smooth.

Known from a single collection from Colorado. The type is at Kew but a better specimen is in Ellis' collection at New York.

Fig. 235.—Ty-los'-to-ma cam-pes'-tre. (C. G. Lloyd).

GROUP 9.

TYLOSTOMA CAMPESTRE.—I do not feel that it is possible to consider this as other than the American form of Tylostoma granulosum. I do not know of a single character to distinguish it. And yet on comparing collections of the American and European plants a general difference is usually seen. The American plant is more robust, the heads are globose and firmer, the cortex peels off more freely in the American plant and does not adhere to the base so strongly. While we believe we could in most cases guess correctly whether a collection was American or European, we would not guarantee to do it in all instances. A plant that does not typically present a single marked character by which it can be known is not a species. We have a few collections that grew in the sand and have more slender stems with mycelial strands strongly developed. This we take to be Tylostoma fibrillosum, but for us it is a condition not a species. A form collected by Mr. Bartholomew, Kansas, is closer to the European plant in stature than to the American, and some specimens have little depressions in the peridium. It was called Tylostoma punctatum.

Tylostoma campestre is the most common species in the United States and the only one that is at all frequent east of the Mississippi. It is most abundant in the neighborhood of the Great Lakes.

Fig. 236.—Ty-los'-to-ma berke-ley'-i-i. (C. G. Lloyd).

TYLOSTOMA BERKELEYII.—Peridium *colored*, reddish brown. Cortex nature of a sand case, separating usually imperfectly and much more strongly adnate than the previous species. Mouth surrounded by a few granular fibrils (the same as the previous plant). Stem *slender*, dark reddish, often slightly scaly, usually strongly sulcate, striate. Capillitium light colored with slightly swollen often oblique septa. Spores 5-6 mic., granulose.

This plant occurs in the southern United States, and is the species referred to in American literature as Tylostoma fimbriatum, surely a misnomer for no similar plant grows in Europe. It was Berkeley I think who first thus determined the American plant, and hence we name it in his honor. This species corresponds to the European only in its mouth

and spore characters. It differs in being a *colored plant* and having a large head and slender stem. A splendid illustration of the plant was given by Petri (Ann. Mycologici, 1904, plate 6) under the name of Tylostoma fimbriatum, and drawn we think from American specimens.

NOTES FROM MUSHROOM LITERATURE IV.

W. A. Kellerman.

Mr. C. H. Kauffman, of the University of Michigan, has published in the Botanical Gazette some observations on Cortinarius as a Mycorhiza-producing fungus. The fungi are very few which have been definitely reported as belonging to this class—in which the hyphae (mycelium) are intimately associated with roots of higher plants, and purveyors of nitrogen. We shallquote liberally from this interesting and important paper. "When we come to a consideration of the agarics our knowledge is meager indeed. Only one investigator, Noack, in 1899, has concerned himself with them. He found that five species of this group were apparently mycorhiza-producers on the forest trees of the locality where he made his observations. Two were Tricholomas; one a Lactarius, and three were Cortinarii. He merely makes the bare statement that they are connected with the rootlets by mycelial strands, which he could easily make out. It is very probable that his observations are correct. It seems to be appreciated that we need some investigation to determine what fungus we are dealing with, so that problems which have to do with the physiological side of mycorhiza may be understood more intelligently; for it is just as likely that knowledge concerning the fungus and its life history may lead to an understanding of the relation of the two organisms as a knowledge of the tree would. It seems worth while, therefore, to report the identity of any such mycorhizal fungi whenever the evidence seemed sufficient to make it acceptable. In a previous paper I pointed out that the members of the genus Cortinarius were so constantly found in limited areas, and some species in such close proximity to certain trees, that it seemed likely that there was some connection. This last summer an effort was made to find out to what extent this might be true. The season was wet during the early summer, and although one finds few Cortinarii as a rule before August, several did occur, and one of these proved to be favorable for my purpose. It not only showed beautifully its connection with the tree roots, but turned out to be an undescribed species of Cortinarius. It was found July 4, 1905, on the south slope of a small ravine along the Huron river, near Ann Arbor, in a layer of humus and forest leaves. This species, as is indeed true of some other fleshy fungi, is characterized by its brick-red mycelial strands and stem. By removing the surface soil it was possible to see the brick-red strands intertwining with the rootlets, apparently in all directions. * * *

"But it was soon found that the reddish net-work extended along definite paths. Beginning with a tiny rootlet, the fungus was followed to a rather large root, apparently growing from a hickory. On examination, however, it was found that the mycorhiza-bearing root passed the hickory, and that all the roots of the hickory examined were devoid of a colored mycorhizal fungus. On the other hand, the root in question was now easily traced to a clump of red oaks. * * *

"About twenty paces down the slope, another troop of the same species of Cortinarius was found. These came up only 30 cm. away from a fine young sugar maple, and close to one of its main roots. Expecting that they were probably attached to the roots of an oak a short distance

away, I dug down carefully and found to my surprise that the strands which were very luxuriant here were attached to the rootlets of the sugar maple. * * *

"An ash, basswood and white oak were examined, but no trace of the fungus found. About 27 dm. from the sugar maple, it was found that some of the strands were apparently attached to a different root. Following this up to a clump of red oaks about 54 dm. away, I was again surprised to find that the oak roots in this case were not conected with the fungus at all, but that the root which was followed—which did not have the appearance of an oak root—belonged to a large *Celastrus scandens* which wound around one of the oaks. It was clear that we had another symbiont connected with the fungus. * * *

"Let it not be supposed that all Cortinarii are mycorhiza-formers, at least normally. *Cortinarius armillatus,* for example, although very partial to *Tsuga canadensis,* is usually found among rotten logs or leaf-mold near this tree, and is probably a saprophyte; on the other hand, it has been found growing out of a cleft at the base of one of these hemlock trees. It seems quite likely, however, that a good many Cortinarii are in symbiotic connection in the manner of the one described in this paper. During several seasons' observations, I have found *C. squammulosus,* C. bolaris, and *C. cinnabarinus* again and again in places which would indicate some relation to one kind of tree. *C. cinnabarinus* seems to prefer the oak, the other two the beech. Noack has shown the connection of *Cortinarius callisteus* with the beech, *C. caerulescens* with the beech, and *C. julmineus* with the oak. Others will, no doubt, be added to the list as soon as observers enter this interesting field."

Fig. 237.—Cor-ti-na'-rius rub'-ri-pes. (C. H. Kauffman.)

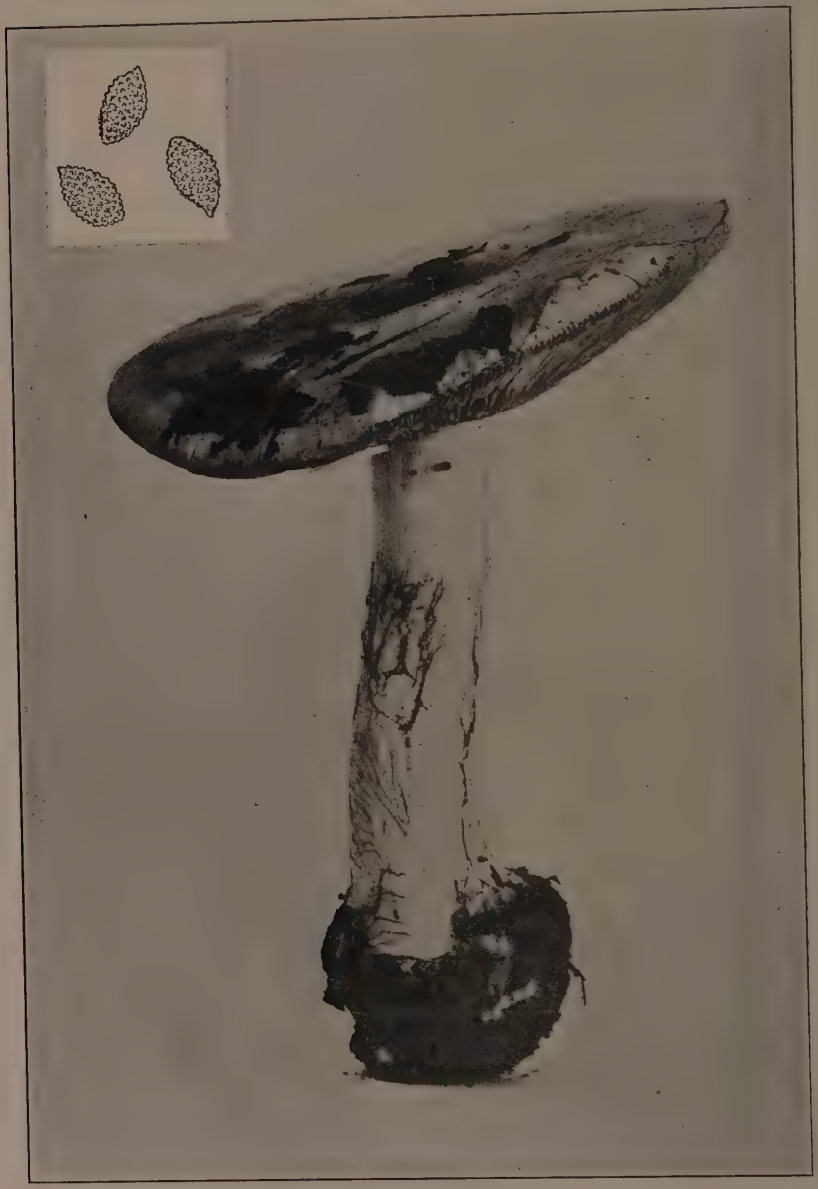

Fig. 238.—Cor-ti-na'-rius at-kin-so-ni-a'-nus. (C. H. Kauffman.)

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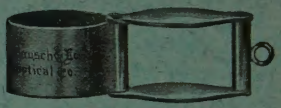

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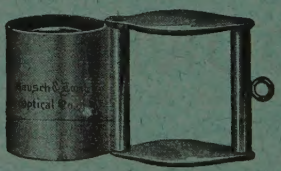

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